



**REQUIREMENTS FOR BUS DUCT ENTRANCE TERMINATION UNIT 063929
FOR USE WITH PAD-MOUNTED TRANSFORMERS**

Asset Type: Electric Distribution **Function:** Design and Construction

Issued By: Lisseth Villareal (LDV2) *Lisseth Villareal* **Date:** 11-01-18

Rev. #11: This document replaces PG&E Document 063929, Rev. #10. For a description of the changes, see Page 11.

This document is also included in the following manual:

- [Electric and Gas Service Requirements Manual](#) (Greenbook)

Purpose and Scope

This document provides the tools, ordering instructions, and the necessary manufacturing specifications and details for the fabrication and assembly of bus duct entrance terminations.

The function of the entrance box is to:

- Provide a means for connecting the customer’s bus duct to a pad-mounted transformer.
- Permit a future, larger transformer to be installed without disturbing the existing bus duct installation.
- Reduce the shutdown time for transformer replacement. The entrance box is furnished with two removable sections to permit access to the bus duct extension connections. PG&E will supply and install the entrance box.

General Information

1. The “Bus Duct Entrance Termination Unit” is used to provide transition from a customer-provided service entrance bus duct to the low-voltage service compartment of a PG&E, pad-mounted transformer, for services of 3,000 to 4,000 amps.
2. Construction
 - A. The unit’s construction design shown in this document shall comply with the Western Underground Committee’s Guide 2.13, latest revision, for tamper-resistant, pad-mounted, equipment enclosures.
 - B. Each top and side cover shall latch and securely self-lock at a minimum of three points, when the unit is assembled. All sharp external corners, edges, and joints shall be smoothed to prevent injury or damage to clothing.
 - C. The edges, seams, and joints shall be made and formed to provide a close-fitting mating surface. Exposed welding on the outside surface of the unit(s) shall be a continuous bead, machined and ground flush.
 - D. All metal work shall be cleaned free of dirt, oils, and rust, and immediately painted, both inside and outside, with one coat of suitable, rust-inhibiting primer, approximately 1.5 mils thick when dry.
 - E. The interior and exterior of the housing shall be finished with one or more coats of Green Munsel, No. 5.5gy, 2.76/2.1 (PG&E No. 610 Green) paint. The total dry film thickness shall not be less than 2 mils (the total paint thickness, including primer, not less than 3.5 mils when dry).
 - F. Approximately a half pint of “touch-up” paint (preferably in an aerosol spray can) shall be included and shipped with each unit (attached inside the unit to the cable support block).
3. Methods of Serving Large Commercial Customers
 - A. Main Service Rating 201 Through 2,500 Amps: The approved method is by underground cable in customer-installed conduit for cable distance 50 feet or less (refer to [Document 063928](#) for details).
 - B. Main Service Rating 3,000 Through 4,000 Amps: The approved method is a PG&E-owned and installed bus duct entrance box attaching to customer-owned and installed bus duct that is a minimum of 30” long.
4. Note: Bus ducts shall only be connected to pad-mounted transformers with a minimum 30-inch deep cabinet and a secondary terminal height of 46 inches from the bottom of the cabinet (Style IIE-LB and IIF, 300 kVA and larger).

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

5. It is recommended to install pad-mounted transformer, bus duct entrance termination box, and customer bus duct entrance box on the same monolithic pad to avoid soil settlement issues. See [Document 043818](#) or [Document 045292](#) for transformer pad dimensions.
6. Service Connection

The customer shall provide a minimum of 36 inches of straight (unbent) bus duct from the bus duct entrance terminating end at the side of the pad-mounted transformer (top entry is not permitted). The customer shall also supply tie straps for collecting like phases, all necessary bus extensions, and bracing for bus extensions, as required. The bus duct shall enter the transformer entrance box in a “horizontal” configuration. PG&E will make the connections from the bus extensions to the transformer secondary terminals, using insulated, flexible, copper conductor provided by PG&E.
7. A termination enclosure is allowed if its installation meets the following requirements:
 - A. Has the same capacity and short circuit rating as the customer’s switchboard.
 - B. Installed at a distance no closer than 60” from the edge of the transformer pad.
 - C. Meets Greenbook specifications as listed below:
 - 5.2.1. Approved Metering and Service Termination Equipment.
 - 5.2.2. Drawing Submittal Requirements for Metering and Service Termination Equipment.
 - 9.10. Underground Service Cable–Termination Section or Pull Box.
 - Table 9 – 4 Minimum Pad–Mounted (Floor–Standing) Switchboard Pull–Section Dimensions: Residential and Nonresidential, Single–Phase and Three–Phase.
 - Figure 9 – 15, Detail of Aluminum, Termination Bus Stubs.
 - 10.3.12. Service Terminations for Underground Services.
 - 10.3.14. Underground, Cable–Terminating Facilities in Pull Boxes or Pull Sections.
8. To provide a water tight transition between the components, the bus duct (flanged ends provided by the customer) must match the dimensions of the transition box assembly and flange plate (Detail A on Page 9).
9. Transformer Bus Duct Cover Plate

A cover used to close off the bus duct entrance hole left in a transformer when it is removed or replaced. This plate bolts into the same bolt holes used for the bus duct entrance termination box and can be installed locally so that the transformer can be reused without sending it to Emeryville to have the opening covered (Code 180203).

References	Location	Document
Connectors for Insulated Cables Underground Distribution Systems	UG-1: Connectors/Greenbook	015251
Concrete Pads for Radial-Style, Three-Phase Pad-Mounted Transformers	UG-1: Transformers	043818
Installation of Loop-Style, Three-Phase, Pad-Mounted Transformers	UG-1: Transformers	045291
Concrete Pad for Three-Phase, Loop-Style, Pad-Mounted Transformers	UG-1: Transformers/Greenbook	045292
Terminating Underground Electric Services 0–600 Volts in Customer-Owned Facilities	UG-1: Services/Greenbook	058817
Methods and Requirements for Installing Commercial Underground Electric Services 0-600 Volts to Customer-Owned Facilities	UG-1: Services/Greenbook	063928

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Installation

Notes

1. Method of installation (see Figure 1 on Page 4) - The location of the edge of the pad must first be established by consultation between PG&E and the building architect or contractor. The bus duct termination end flange and flange plate shall be located such as to permit its connection to the bus duct entrance termination box at a point 23 inches to 24 inches from the edge of the pad. The vertical centerline of the bus duct entrance termination box shall be located 23 inches from the front edge of the transformer pad (see Figure 1, Section A-A and Figure 2, Section B-B on Page 4). Additionally, there must be a minimum of 60 inches straight length between the edge of the pad and any obstruction (joint, bend, support, apparatus, wall or building, etc) in the bus duct to accommodate the 48" long bus duct entrance termination box provided by PG&E.

These dimensions will accommodate all style IIB, IIC, IIE, IIF, IIG, and IIH transformers used in bus applications.

2. Bus duct flange plate (see Detail A on Page 9) - A removable bus duct end flange plate shall be provided by the customer at the transformer end of the bus duct. This plate shall not be drilled. PG&E will locate and drill 1/2-inch diameter holes in the flange plate to match the square holes in the adjustable end flange of the entrance box.
3. Transformer cabinet bus duct cutout - The horizontal centerline of the bus duct termination box in the side of the transformer shall be approximately 24 inches above the top of the pad. The cutout dimensions and drilling for bolt holes must match the dimensions and drilling of the entrance box, as determined in the field. A template is provided in the kit to help in positioning the flanged end and locating the mounting holes.
4. Bus duct connections in transformer (see Figure 3 on Page 5)
 - A. For two and three bars per phase, the customer shall provide tie straps bolted across like phases where they enter the transformer entrance box.
 - B. PG&E will provide the flexible copper conductor and spade connectors necessary to make the connection between the secondary spades of the transformer and the customer's bus duct.
 - C. The customer shall furnish the tie bars (Section F-F on Page 9) and spacers (Detail D on Page 9) with the bus duct. The bus duct must be in a horizontal configuration when entering the entrance box.
 - D. PG&E will provide the necessary spade supports for the protection of the transformer. See [Document 045291](#) for further information on the secondary cable support kit (M019644).
5. Feeder bus duct and entrance box supports - Feeder bus duct supports (where necessary) are required to be installed by the customer. The entrance box shall not be used as a bus duct support. PG&E will provide and install a support (supports are not part of a kit) for the bus duct entrance termination box, as shown in Figure 1 and Figure 2 on Page 4, and Detail F on Page 10.

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Installation (continued)

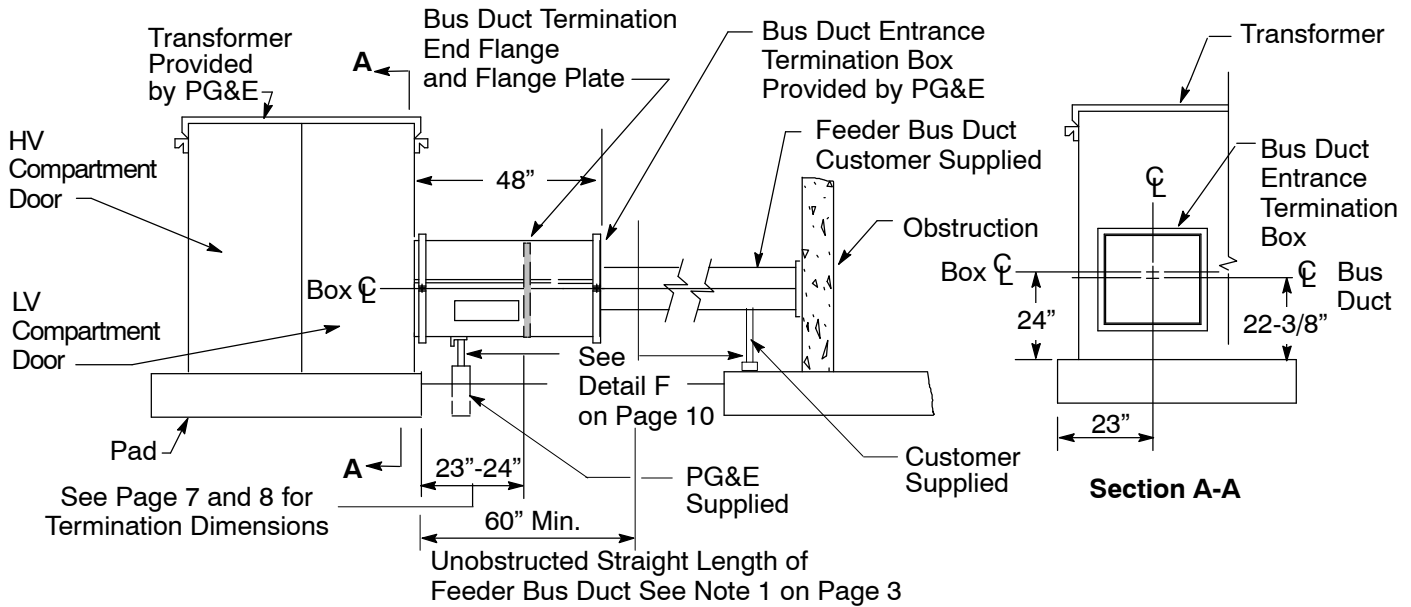


Figure 1
Typical Bus Duct Assembly for Largest Pad-Mounted Transformer

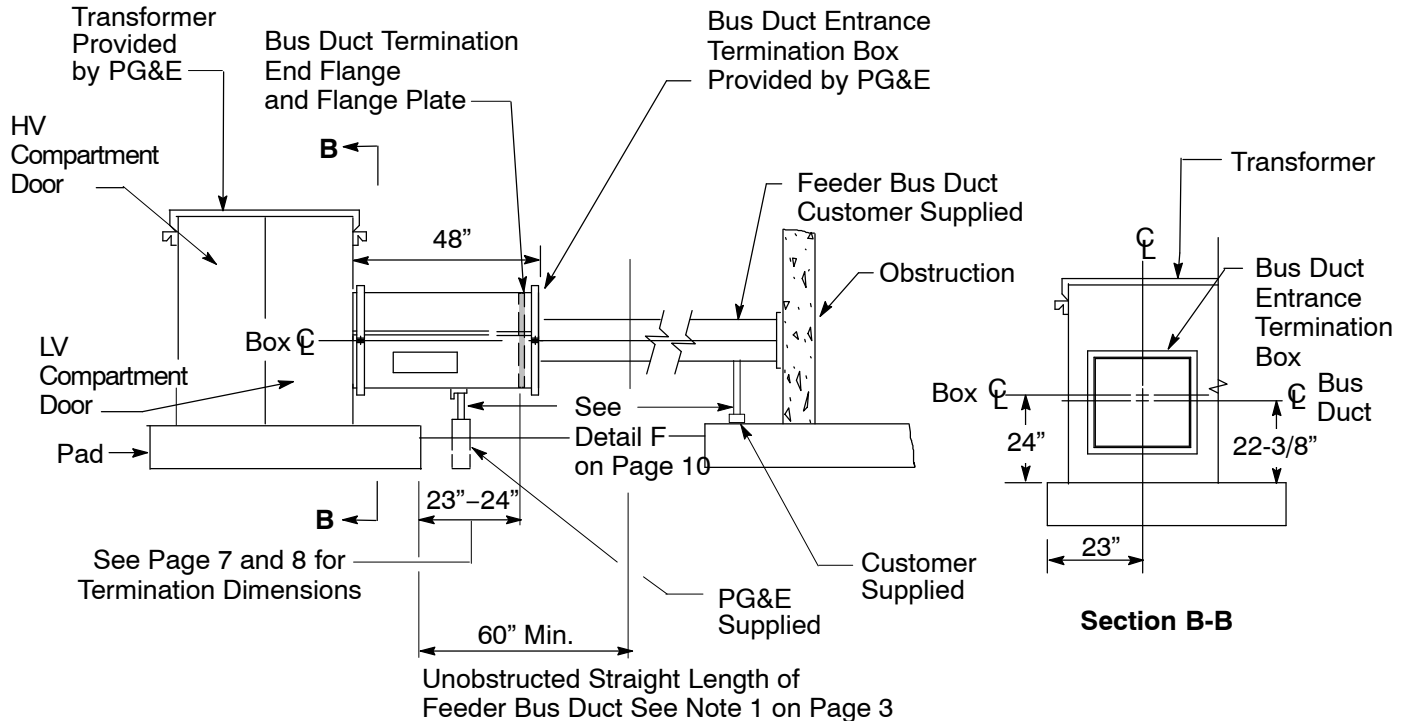


Figure 2
Typical Bus Assembly for Smallest Pad-Mounted Transformer

Note: Dimensions in all Figures are not to scale.

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Bus Duct Entrance Termination Box Assembly

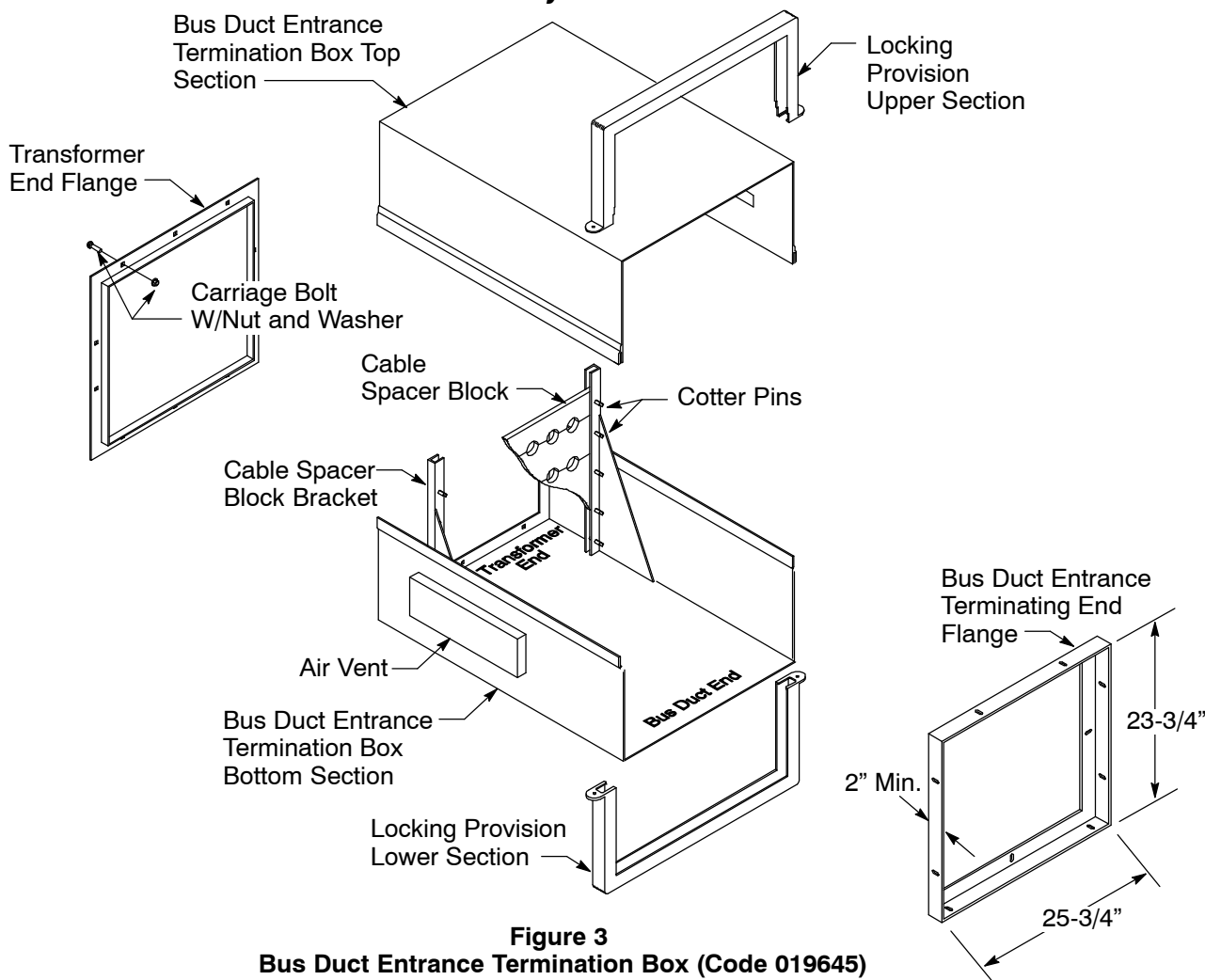


Figure 3
Bus Duct Entrance Termination Box (Code 019645)

Table 1 List of Material for Bus Duct Entrance Termination Box Kit ¹

Quantity	Description
1	Stainless Steel Bus Duct Entrance Termination Box
1	Cable Spacer
4	Copper Bus Bar Extensions (see Detail E on Page 10)
24	1" x 3/8" Carriage Bolts With Nuts and Washers
2	3/8" x 3-1/2" Bolt, With Nut and 3/16" Diameter Hole for Safety Lock
2	Safety Locks, Utilco Catalog Number PEL-1, Code 170115
10-Foot Length	Weather Stripping
1	Template

¹ When needed, use and order secondary cable support kit M019644 (see [Document 045291](#)). This kit is not included in the bus duct termination box kit.

**Requirements for Bus Duct Entrance Termination Unit
for Use With Pad-Mounted Transformers**

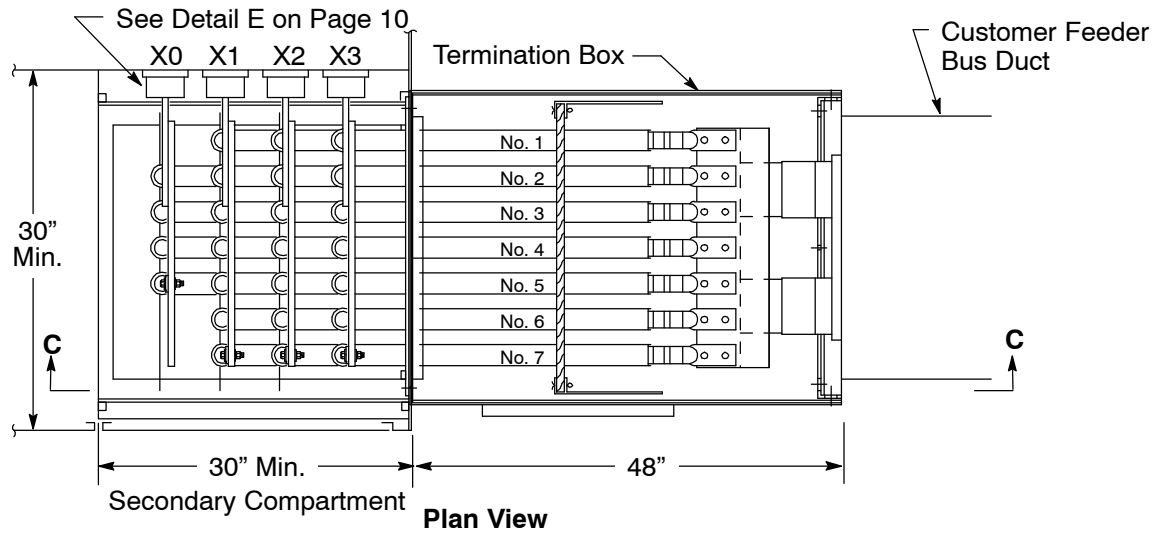
Bus Duct Entrance Termination Box Assembly (continued)

Table 2 Recommended Tools for Assembly and Installation of Bus Duct Entrance Termination Box

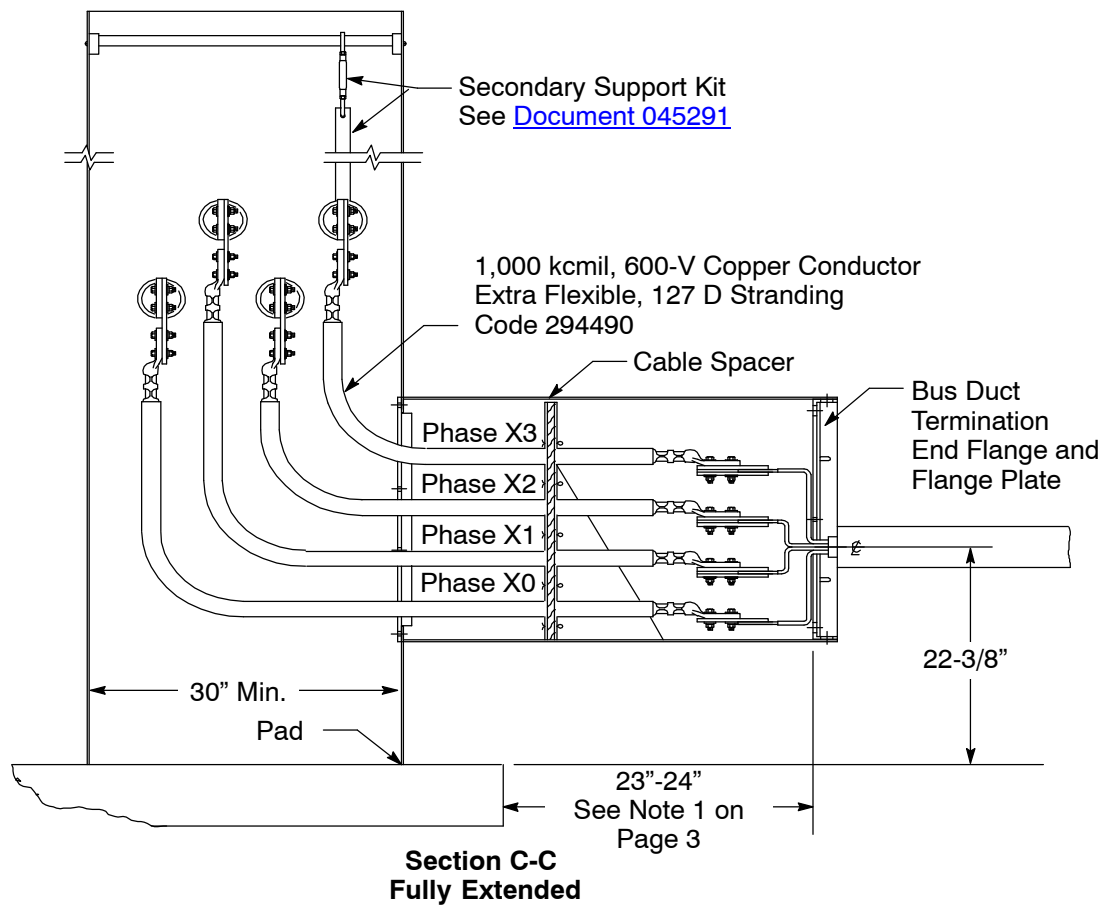
Description	Code
Sawzall, Heavy Duty, Milwaukee #6511-W/Case	210075
Blades, Sawzall, Milwaukee #48-00-1171 – Package of 10	207674
Drill, Skil #6550, 1/2" Variable Speed Reversible	210026
Drill Bit Set, 1/16" to 1/2", W/Case	203026
Punch, Center, 3/8"	201305

Requirements for Bus Duct Entrance Termination Unit
for Use With Pad-Mounted Transformers

Bus Duct Termination Assembly – Fully Extended



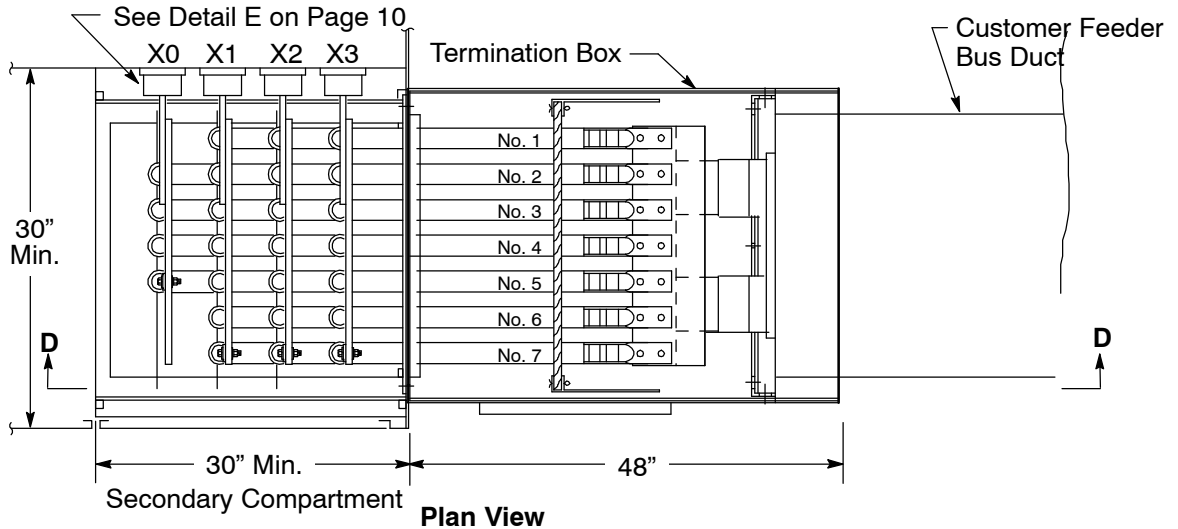
Typical Outdoor Bus Termination Fully Extended



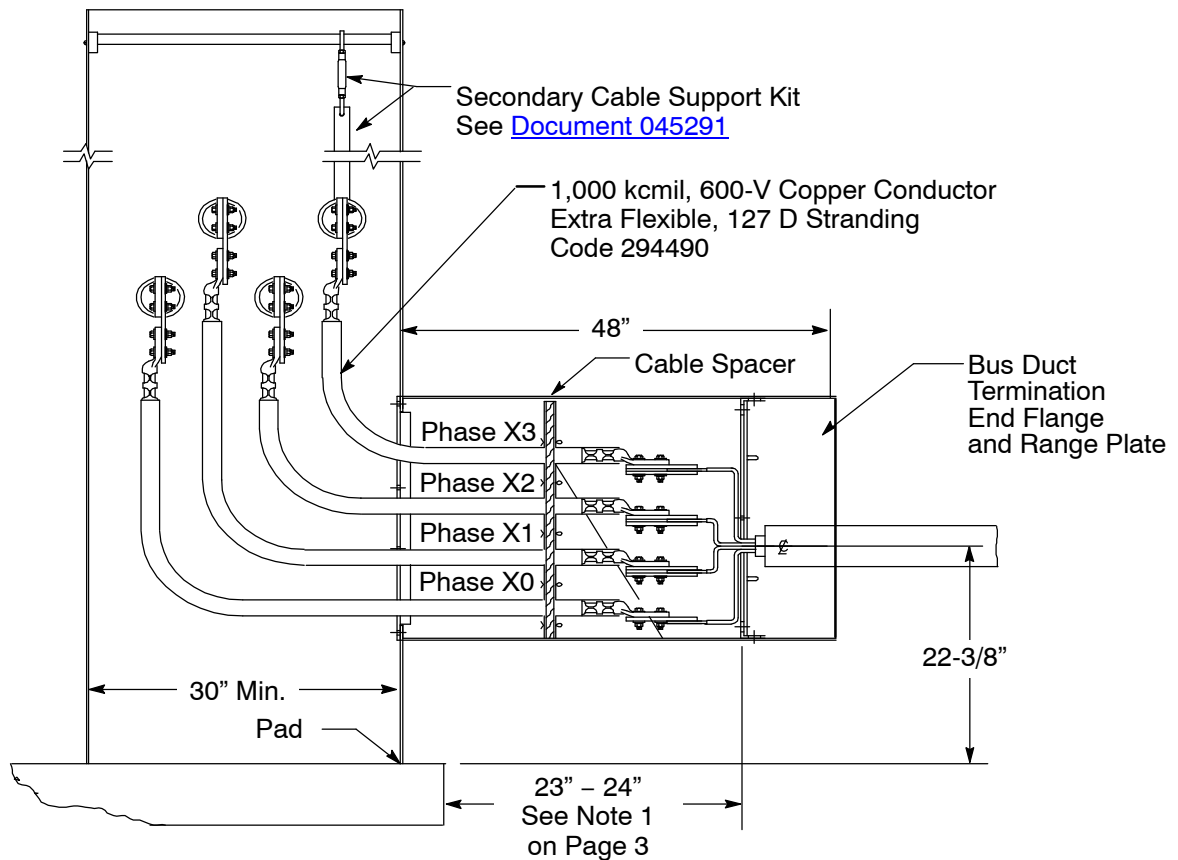
**Figure 4
Bus Duct Termination Assembly Fully Extended**

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Bus Duct Termination Assembly – Fully Compressed



Typical Outdoor Bus Termination Fully Compressed



**Figure 5
Bus Duct Termination Assembly Fully Compressed**

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Bus Duct Termination Assembly – Details

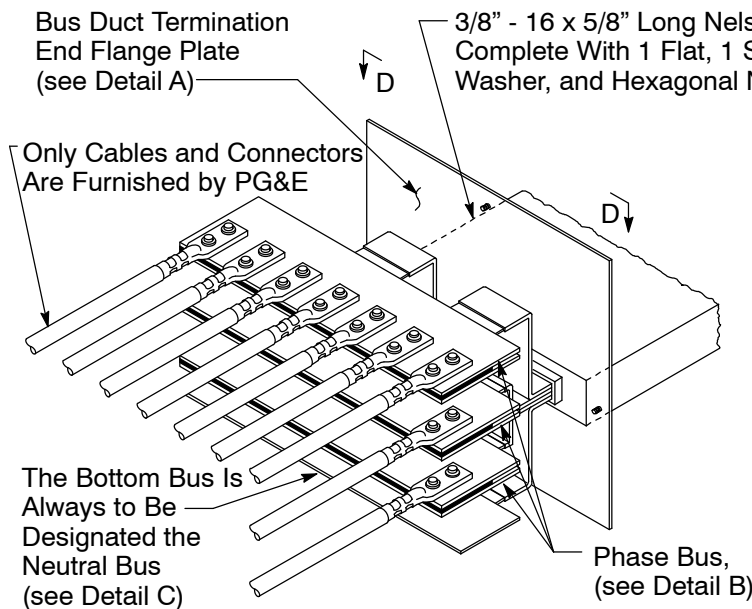
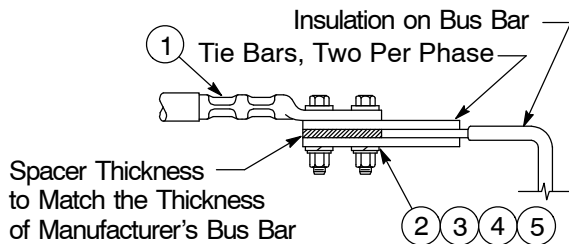
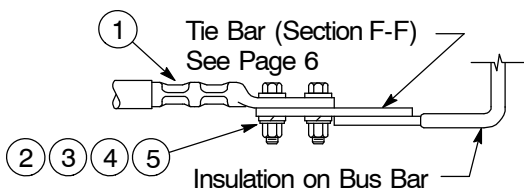


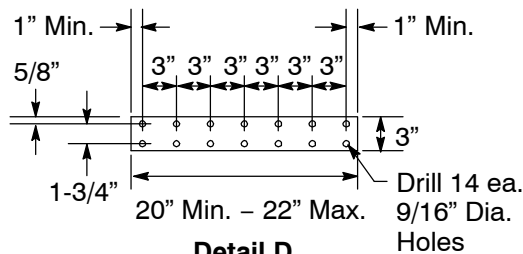
Figure 6
Termination Detail With
Bus Duct End and Tie Bars



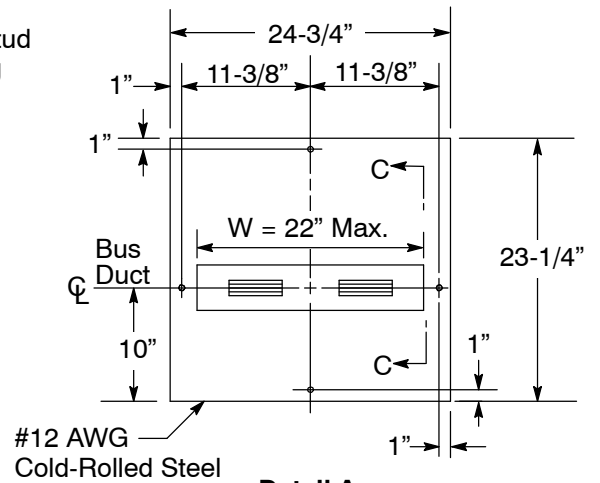
Detail B
Typical Phase Bus Termination Assembly



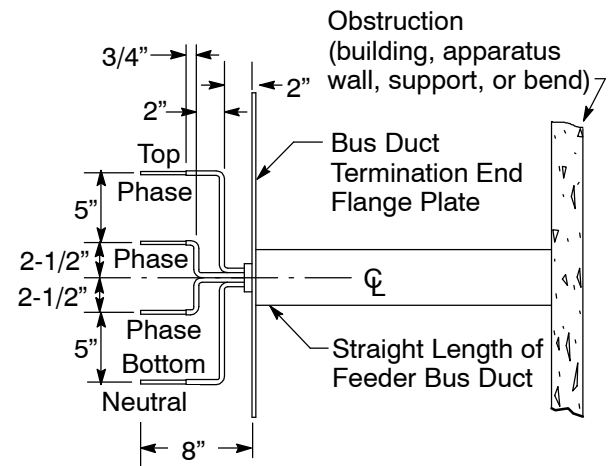
Detail C
Typical Neutral Bus Termination Assembly



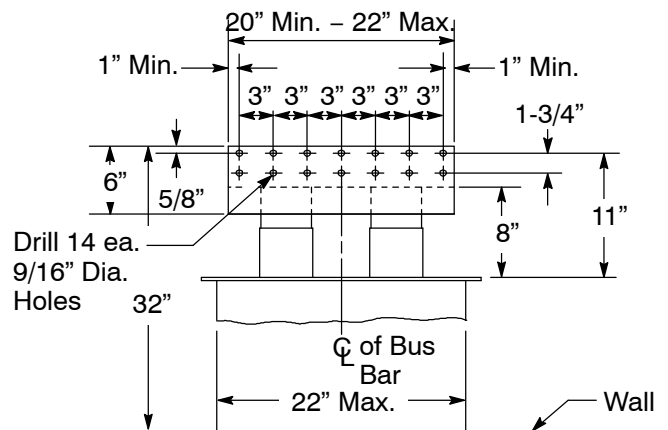
Detail D
Spacer 3" x 20" Long Copper
(thickness to suit)
(customer supplied)



Detail A
End Flange Plate
(customer supplied)



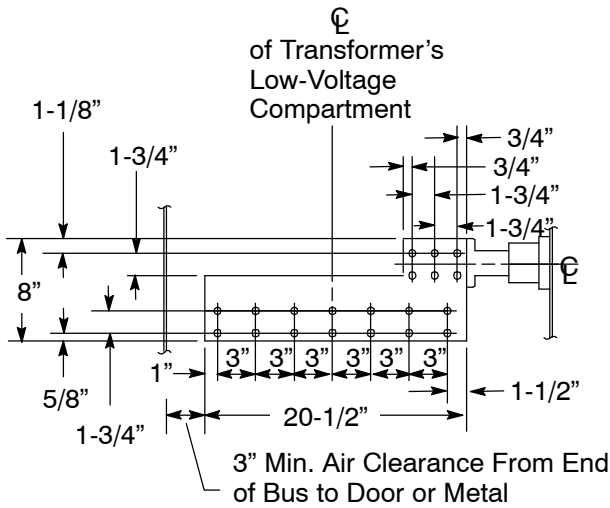
Section E-E
Bus Bar
(customer supplied)



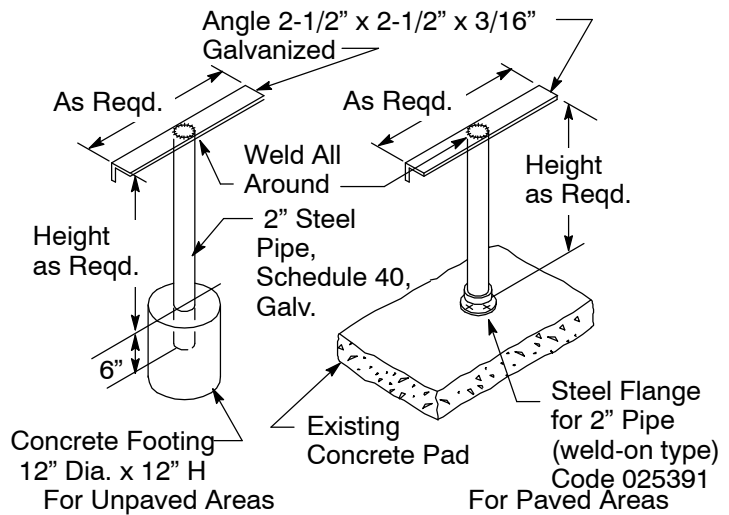
Section F-F
Tie Bar Connection 1/4" x 6" x 20" Long Copper
(two per phase and one per neutral required)
(customer supplied)

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Bus Duct Termination Assembly – Details (continued)



Detail E
Copper Bus Bar Extension
(see Table 1 on Page 5)



Detail F
Termination Unit Supports
(PG&E supplies one under the bus duct termination box. Customer supplies remainder as required.)

Table 3 Copper Conductor Requirements ²

Main Switch Rating	Number of Conductors Per Phase	Number of Neutral Cables	Approximate Footage of Conductor
2,500	4	2	140
3,000	5	3	180
3,500	6	3	210
4,000	7	4	250

² Use only 1,000 kcmil copper cable (Code 294490).

Table 4 List of Materials for Bus Termination Assemblies (see Detail B and Detail C on Page 9)

Item	Description	Code	Document
1	Terminal Connector, Compression-Type, Cable-to-Flat, for 1,000 kcmil Cable	303461	015251
2	Screw, Cap (bolt), Hex. Head, 1/2" x 2-1/2", Everdur or Equivalent	193177	–
3	Nut, Bolt, Hex., 1/2", Everdur or Equivalent	195013	–
4	Washer, Round, 1/2", Everdur or Equivalent	195252	–
5	Washer, Lock, 1/2", Everdur or Equivalent	195193	–

Requirements for Bus Duct Entrance Termination Unit for Use With Pad-Mounted Transformers

Revision Notes

Revision 11 has the following changes:

1. Revised Note 3A on Page 1.
2. Revised Note 6 on Page 2. Changed 30 inches to 36 inches as minimum length of straight bus duct.
3. Added new Note 7 and re-numbered the remaining Notes on Page 2.
4. Changed 54 inches to 60 inches for minimum straight section on Note 1 on Page 3.
5. Revised Note 4D on Page 3.
6. Revised Table 1 on Page 5.
7. Added pointer and text to Figures 4 and 5 on Pages 7 and 8.

